

Mammalia, Chiroptera, Molossidae, *Molossus rufus* É. Geoffroy, 1805: Distribution extension

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ABSTRACT: This paper presents seven new records of occurrence of *Molossus rufus* for the state of Rio Grande do Sul, Brazil, three from the Atlantic Forest Biome and four from the Pampa Biome. The southern limit of the known geographical distribution of this species in Brazil is extended by 159 km.

Molossidae includes 26 species of insectivorous bats occurring in the Brazilian territory (Fabian and Gregorin 2007). Many of these species have been recorded exploring shelters in human habitations or in the peridomiciliary environment (Taddei 1997; 1999). This habit, coupled with positive results for the rabies virus in species of the family (Uieda *et al.* 1995; Ministério da Saúde 1996; Cunha *et al.* 2006), generates important ecological, social, economic and health implications for the group (Gregorin and Taddei 2002).

Molossus represents the standard morphotype for Molossidae: thick uropatagium, tail usually extended by a third or more of the total length beyond the distal edge of the interfemoral membrane, well-developed ears, with an internal keel prominent. The diagnostic features of the genus include skull with sagittal crest developed, palate shallow, triangular upper incisors, incisors 1/1 and pre-molars 1/2 (Gregorin and Taddei 2002). The genus includes eight formally described species (Simmons 2005), five of which occur in Brazil (Fabian and Gregorin 2007). In this study, *Molossus rufus* will be taken as valid in lieu of *Molossus ater* É. Geoffroy, 1805 (Carter and Dolan 1978; Dolan 1989).

According to Gregorin and Taddei (2002), *Molossus rufus* can be distinguished from other species of the genus by the presence of a well-developed anterior sagittal crest, upper incisors short and spatulate, with completely convergent apices, and larger body size. Among the skull and body dimensions used in the discrimination of species in the genus *Molossus*, the most important ones are greater length of skull (GLS), length of maxillary toothrow (LMT), zygomatic breadth (ZB), mastoid breadth (MB), length of forearm (LF), length of metacarpals III, IV and V (MIII, MIV, MV), length of phalanx I and II of digit III (FI, FII) and length of ear (LE) (*sensu* Gregorin and Taddei 2002). These animals are very high and fast flyers, making it difficult to collect individuals using conventional methods (*e.g.* mist nets) without prior knowledge of their shelters and

foraging routes. Gregorin and Taddei (2002) attributed the small number of individuals available in scientific collections to this fact.

The distribution of *Molossus rufus* extends from Sinaloa, in Mexico, throughout Central and South America until the Espinal biome in Argentina (Barquez *et al.* 1999) and Pampa biome in Uruguay (González and Lanfranco 2010). Its southernmost boundary in Brazil is still uncertain (Fabian and Gregorin 2007). This species has been recorded in the municipality of Santa Maria (Santos *et al.* 2008), in the valley of Taquari River (Grillo *et al.* 2003), and in the metropolitan region of Porto Alegre (Pacheco *et al.* 2010). All the Brazilian regions mentioned are located in the area of ecological tension between the Pampa and Atlantic Forest biomes.

Herein we document seven new locality records for *Molossus rufus* in the State of Rio Grande do Sul, southern Brazil (Figure 1). Four of these localities are situated in the Pampa biome (Dom Pedrito, Lavras do Sul, Formigueiro and Tapes) and three in the Atlantic Forest biome (Guaporé, Entre-Ijuís and Chapada). These records were obtained during inventories and monitoring of mammals in areas of influence of projects for energy exploration or irrigation projects undergoing environmental licensing process. Voucher specimens were collected (IBAMA license number: 185/2009) and deposited in the mammal collection of Museu de Ciências Naturais (MCNU) of Universidade Luterana do Brasil.

Measurements of all variables previously cited above as important in the taxonomy of *Molossus* spp. were obtained from these specimens. These measurements were taken with a digital caliper, following criteria described by Gregorin and Taddei (2002). One of the records was obtained after analyzing pellets of *Tyto alba* (Scopoli, 1769). The other records were obtained through surveys of potential shelters for chiroptera and subsequent mounting of mist-nets over the colony's exit point. In the following paragraphs we present information about the

collection events and localities, as well as species found in sympatry with *M. rufus*:

1) Dom Pedrito: This record extends the southern limit of the known geographical distribution in Brazil by 159 km. On December 29, 2008, five specimens were captured in the ceiling of the town hall (30°59'14" S, 54°40'35" W). Only one specimen was collected (MCNU-2572). The same construction was used as shelter by *Tadarida brasiliensis* (I. Geoffroy, 1824). Located on the right bank of the Santa Maria River, the original steppe vegetation has been noticeably altered by urban development (IBGE 2004).

2) Lavras do Sul: On September 14, 2010, twenty specimens were captured in a hollow *Eucalyptus* sp. in the rural area (30°50'34" S, 54°32'23" W). Only one specimen was collected (MCNU-2573). Located on the right bank of the Taquarembó River, the original steppe vegetation has been noticeably altered by cattle ranching and soya production (IBGE 2004). Colonies of *Histiotus velatus* (I. Geoffroy, 1824) and *T. brasiliensis* were observed during the surveys. Both species inhabited the ceilings of buildings within about 5000 meters from where *M. rufus* was collected.

3) Formigueiro: On July 27, 2010, a specimen was found present in pellets of *T. alba* collected in the rural area (30°00'59" S, 53°25'24" W) (CF-MCNU-1477). Located on the right bank of São Sepé River, the original steppe vegetation has been noticeably altered by cattle ranching and rice plantations (IBGE 2004). Colonies of *Desmodus rotundus* (É. Geoffroy, 1810) and *Glossophaga soricina* (Pallas, 1766) were observed during the surveys. Both inhabited the ceilings of buildings. The mist-nets mounted in a peridomiciliary orchard enabled us to capture individuals of *Sturnira lilium* (É. Geoffroy, 1810) and *Artibeus lituratus* (Olfers, 1818). All occurrences were recorded 100 meters from the collection point of *M. rufus*.

4) Tapes: On February 1, 2011, two specimens were captured in a mixed colony with *Molossus molossus* (Pallas, 1766) in a ceiling of an inhabited building in the rural area (30°48'45" S, 51°31'19" W). Only one specimen was collected (MCNU-2574). Located on the left bank of the Velhaco River, the original steppe vegetation has been noticeably altered by cattle ranching and rice plantations (IBGE 2004). Colonies of *H. velatus*, *G. soricina* and *T. brasiliensis* were observed in the ceilings of buildings. A group of *Eptesicus brasiliensis* (Desmarest, 1819) was found inside a hollow *Pyrus* sp. All records occurred during surveys of potential shelters up to 200 meters from where *M. rufus* was collected.

5) Guaporé: On April 14, 2007, one specimen (MCNU-2575) was captured in a mixed colony with *M. molossus* in a ceiling of an inhabited building in the rural area (28°54'30" S, 51°56'34" W). Located on the right bank of Guaporé River, the original deciduous seasonal forest has been noticeably altered by livestock farms and corn plantations (IBGE 2004). A colony of *Myotis nigricans* (Schinz, 1821) was found occupying cracks between rocks located 50 meters from where *M. rufus* was collected.

6) Entre-Ijuís: On April 24, 2009, 36 specimens were captured in the ceiling of an inhabited building in the rural area (28°23'27" S, 54°17'12" W). Only one specimen was collected (MCNU-2576). Located on the left bank of

Ijuízo River, the original deciduous seasonal forest has been noticeably altered by livestock farms and corn and soybean plantations (IBGE 2004). A colony of *Chrotopterus auritus* (Peters, 1856) was found in the ceiling of an abandoned building. The mist-nets mounted in a peridomiciliary orchard enabled us to capture individuals of *S. lilium* and *D. rotundus*. All occurrences were recorded 5000 meters away from where *M. rufus* was collected.

7) Chapada: On January 19, 2007 seven specimens were captured in the ceiling of an inhabited building in the rural area (28°05'27" S, 52°59'03" W). Only one specimen was collected (MCNU-2577). Located on the right bank of Várzea River, the original deciduous seasonal forest has been noticeably altered by livestock farms and corn and soybean plantations (IBGE 2004). A colony of *T. brasiliensis* was found occupying a building 50 meters from where *M. rufus* was collected.

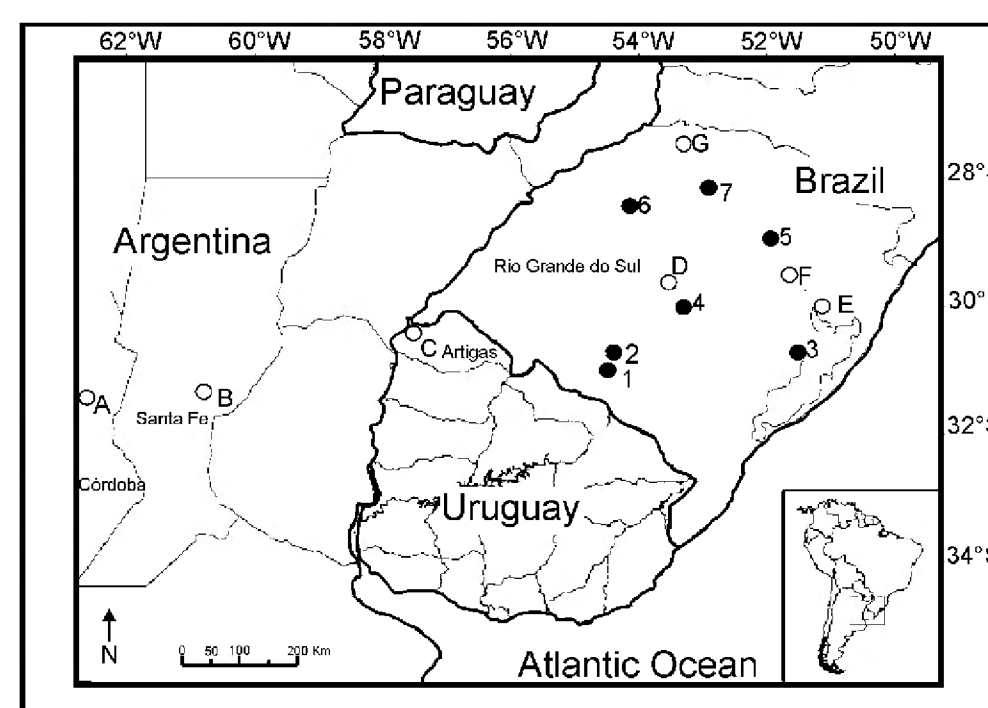


FIGURE 1. Records of *Molossus rufus* in the extreme south of its distribution area. White circles refer to published data. Argentina: A = Córdoba (Barquez et al. 1999); B = Santa Fé (Barquez et al. 1999). Uruguay: C = Artigas (González and Lanfranco 2010). Brazil: D = Santa Maria (Santos et al. 2008); E = Metropolitan region of Porto Alegre (Pacheco et al. 2010); F = Valley of Taquari River (Grillo et al. 2003); G = Frederico Westphalen (Bernardi et al. 2009). Black circles refer to new records. Brazil: 1 = Dom Pedrito, extreme south of the species distribution in Brazil; 2 = Lavras do Sul; 3 = Tapes; 4 = Formigueiro; 5 = Guaporé; 6 = Entre-Ijuís; 7 = Chapada.

The joint analysis of biometric measures shows that the specimens are cited within the range presented by Gregorin and Taddei (2002) (Table I). Despite the apparent lack of information regarding *M. rufus*, the species is not mentioned in any regional (Pacheco and Freitas 2003), national (Chiarello et al. 2008) or global (IUCN 2010) threat category. However, Gonzalez and Lanfranco (2010) consider this species as possibly threatened in the Uruguayan territory. The lack of systematic and biogeographic studies in the Pampa biome, mainly with regard to marsupials, rodents and bats, makes it difficult to accurately assess the diversity and conservation of mammals in this region of Brazil. These new southern records reflect the ecological plasticity of *M. rufus* to tolerate lower average temperatures, different interspecific relationships and typical grassland habitats modified by human action. Moreover, they emphasize the importance of enriching the conventional sampling effort using mist nets with complementary methods such as active search for colonies and pellet analysis of birds of prey.

TABLE 1. External and cranial measurements (in mm) of *Molossus rufus* from several localities in the state of Rio Grande do Sul, southern Brazil (see text for acronyms).

VOUCHER	MCNU-2572	MCNU-2573	CF-MCNU-1477	MCNU-2574	MCNU-2575	MCNU-2576	MCNU-2577
Locality	Dom Pedrito	Lavras do Sul	Formigueiro	Tapes	Guaporé	Entre-Ijuís	Chapada
Sex	Male	Male	Indeterminate	Male	Female	Male	Female
GLS	22.37	24.44	20.85	21.42	20.22	21.36	20.74
LMT	8.5	8.4	-	8.46	7.62	8.08	7.94
ZB	14.17	14.07	13.87	13.6	12.6	-	-
MB	13.87	13.75	13.08	12.55	11.93	13.74	13.04
LF	51.79	51.73	-	52.72	50.77	51.24	47.27
MIII	52.38	52.35	-	53.39	49.87	51.75	48.84
MIV	51.75	51.38	-	51.98	48.69	50.85	48.46
MV	33.67	33.24	-	34.92	32.8	33.01	32.41
FI	24.3	25.96	-	26.23	24.96	24.34	23.18
FII	21.6	21.11	-	22.47	20.91	21.32	20.28
LE	15.54	15.6	-	15.28	14.53	14.8	14.89

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LITERATURE CITED

Barquez, R.M., M.A. Mares and J.K. Braun. 1999. *The bats of Argentina. Special Publications of the Museum* 42. Lubbock: Texas Tech University Press. 285 p.

Bernardi, I.P., J.M.D. Miranda, J. Sponchiado, E. Grotto, F.F. Jacomassa, E.M. Teixeira, S.H. Roani and F.C. Passos. 2009. Morcegos de Frederico Westphalen, Rio Grande do Sul, Brasil (Mammalia: Chiroptera): riqueza e utilização de abrigos. *Biota Neotropica* 9(3): 1-6.

Carter, D.C. and P.G. Dolan. 1978. Catalogue of type specimens of neotropical bats in selected european museums. *Special Publications The Museum Texas Tech University* 15(1): 11-135.

Chiarello, A.G., L.M.S. Aguiar, R. Cerqueira, F.R. Melo, F.H.G. Rodrigues and V.M.F. Silva. 2008. Mamíferos ameaçados de extinção no Brasil; p. 680-880 *In* A.B.N. Machado, C.M. Drummond and A.P. Paglia (ed.). *Livro Vermelho da Fauna Brasileira Ameaçada de Extinção*. Brasília e Belo Horizonte: Ministério do Meio Ambiente/Fundação Biodiversitas.

Cunha, E.M.S., L.H.Q. Silva, M.C.C.S.H. Lara, A.F.C. Nassar, A. Albas, M.M. Sodr  and W.A. Pedro. 2006. Bat rabies in the north-northwestern regions of the state of S o Paulo, Brazil: 1997-2002. *S ude P blica* 40(6): 1082-1086.

Dolan, P.G. 1989. Systematics of middle american mastiff bats of the genus *Molossus*. *Special Publications The Museum Texas Tech University* 29(1): 1-71.

Fabian, M.F and R. Gregorin. 2007. Fam lia Molossidae; p. 149-166 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). *Morcegos do Brasil*. Londrina: Universidade Federal de Londrina.

Gregorin, R. and V.A. Taddei. 2002. Chave artificial para a identifica  o de Moloss deos brasileiros (Mammalia, Chiroptera). *Mastozoologia Neotropical* 9(1): 13-32.

Grillo, H.C.Z., E. Marder and V.A. Rosa. 2003. Composi  o da Quiropterofauna do Vale do Taquari, Rio Grande do Sul, Brasil. *Divulga  es do Museu de Ci ncia e Tecnologia – UBEA/PUCRS* 2(1): 54-55.

Gonz les, E.M. and J.A.M. Lanfranco. 2010. *Mam feros de Uruguay. Gu a de Campo e Introducci n a su Estudio y Conservaci n*. Montevideo: Banda Oriental/Vida Silvestre/MNHN. 464 p.

IBGE 2004. *Mapa de Vegeta  o do Brasil, Esc. 1:5.000.000*. Electronic Database accessible at ftp://ftp.ibge.gov.br/Cartas_e_Mapas/Mapas_Murais/. Captured on 19 April 2010.

IUCN 2010. *IUCN Red List of Threatened Species. Version 2010.4*. Electronic Database accessible at <http://www.iucnredlist.org/>. Captured on 20 April 2010.

Minist rio da S ude. 1996. *Morcegos em  reas urbanas e rurais: Manual de manejo e controle*, Bras lia: Funda  o Nacional de S ude, 117 p.

Pacheco S.M. and T.R.O. Freitas. 2003. Quir pteros; p. 493-498 *In* C.S. Fontana, G.A. Bencke and R.E. Reis (ed.). *Livro vermelho da fauna amea ada de extin  o no Rio Grande do Sul*. Porto Alegre: EDIPUCRS.

Pacheco, S.M., M. Sodr , A.R. Gama, A. Bredt, E.M.C. Sanches, R.V. Marques, M.M. Guimar es and G. Bianconi. 2010. Morcegos Urbanos: Status do Conhecimento e Plano de A  o para a Conserva  o no Brasil. *Chiroptera Neotropical* 16(1): 629- 647.

Santos, T.G., M.R. Spies, K. Kopp, R. Trevisan and S.Z. Cechin. 2008. Mam feros do Campus da Universidade Federal de Santa Maria, Rio Grande do Sul, Brasil. *Biota Neotropica* 8(1): 1-7.

Simmons, N.B. 2005. Order Chiroptera; p. 312-529 *In* D.E. Wilson and D.M. Reeder (ed.). *Mammal species of the world:a taxonomic and geographic reference*. Washington and London: Smithsonian Institution Press.

Taddei, V.A. 1997. Sistem tica de quir pteros. *Boletim do Instituto Pasteur* 1(2): 3-15.

Taddei, V.A. 1999. Os morcegos; p. 249-283 *In* F.A.M. Mariconi (ed.). *Insetos e outros invasores de resid ncias*. Piracicaba: Universidade de S o Paulo.

Uieda, W., N.M.S. Harmani and M.M.S. Silva. 1995. Raiva em morcegos inset voros (Molossidae) do Sudeste do Brasil. *Revista S ude P blica* 29(5): 393-397.

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